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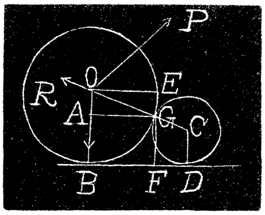
MECHANICS.

135. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy, Defiance College, Defiance, Ohio.

What force acting at an inclination ω with a horizontal line on the center of a wheel of given weight will roll the wheel over an immovable cylindric log whose diameter is $(1/m)$th that of the wheel?

II. Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.



Let $CD=GC=a$, $OB=OE=ma$, P=force, R=reaction, W=weight of wheel, $\angle POE=\omega$, $\angle AOC=\theta$.

Resolving vertically, $W=R\cos\theta$.

Resolving horizontally, $P\cos\omega=R\sin\theta$.

$\therefore P\cos\omega/\sin\theta=W/\cos\theta$.

$\therefore P=W\tan\theta\sec\omega$.

$GF=a+a\cos\theta=a[1+\cos\theta]$.

$AO=ma\cos\theta=ma-a[1+\cos\theta]$.

$\therefore \cos\theta=[m-1]/[m+1]$. $\tan\theta=2\sqrt{m}/[m-1]$.

$$\therefore P=\frac{2W\sqrt{(m)}\sec\omega}{m-1}.$$

136. Proposed by F. T. WRIGHT, Ph. B., Schenectady, N. Y.

In an air brake test a train moving at 22 miles an hour on a down grade of one per cent. was stopped in 91 feet. There was 94 per cent. of the train braked. Taking the fractional resistance as 8 pounds per ton, find the net brake resistance per ton.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

Let the train weight T tons of 2240 lbs. The work due to gravity is $T(91\times2240)/100$. 22 miles per hour=$32\frac{4}{15}$ feet per second.

Let x=net brake resistance, g=32.16. Then

$$\frac{2240(32\frac{4}{15})^2T}{64.32}=8\times91T+\frac{94\times91Tx}{100}-\frac{91\times2240\,T}{100}.$$

$\therefore 36258.53=728+85.54x-2038.40$. $85.54x=37568.93$.

$x=439.2$ pounds per ton.

137. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

A uniform inextensible string rests against the inner side of a smooth elliptic wire semi-axes a and b, and is repelled from the foci and the center by the following forces: μ/rd and $\nu/r'd$ emanating from the foci, and $\pi c/d$ from the center, the distances of any point on the string from the foci being r and r', respectively, its distance from the center being c, and the semi-conjugate diameter corresponding to the point being d. Find the pressure on the wire at any point.